Work (Scientific Definition):

- Work equals net force displacement $\cos\theta$
- doing something that requires energy
- any energy needed to complete a task
- force acting over a distance
- energy exerted on an object
- work done on an object when a force causes displacement on said object

"Official" Scientific Definition of Work:

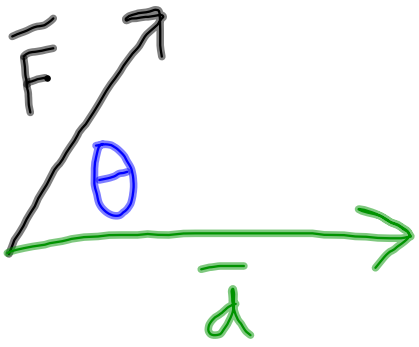
Dot (scalar) product

$$\text{Work} = \vec{F}\text{orce} \cdot \text{displacement}$$

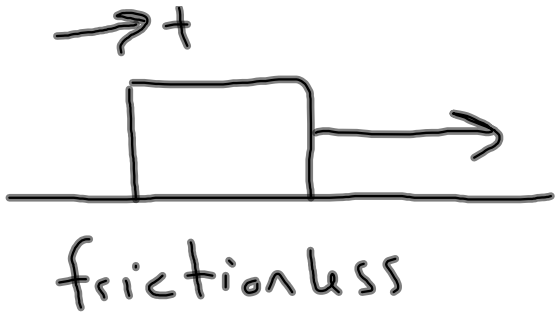
scalar — vector — vector

$$= (\text{Force})(\text{displacement})\cos\theta$$

mag. of force — mag. of disp. — angle bet. $\vec{F}$ and $\vec{d}$



units: $J = N \cdot m = kg \cdot m^2/s^2$

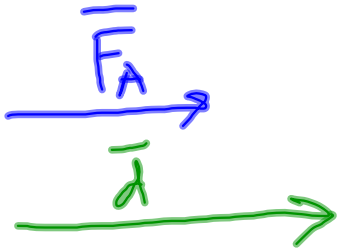


Block of $m = 20\,kg$

Applied force $= +100\,N$

displacement $= +2\,m$

Find net work done on the block

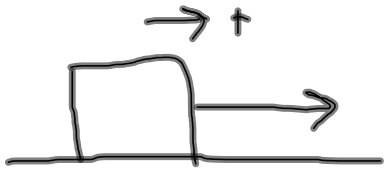


$\theta = 0°$

$$W_{net} = W_A = F_A\, d \cancel{\cos\theta}^{1}$$

$$= (100\,N)(2\,m)$$

$$= 200\,J$$

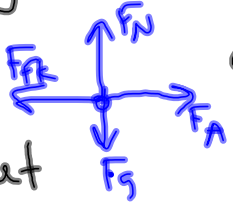


$m = 20\ kg$

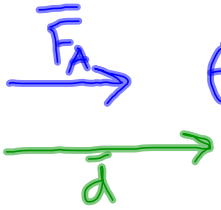
$F_A = +100\ N$

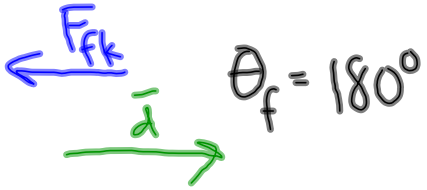
$d = +2\ m$

$\mu_k = 0.25$



find W_{net}





$$W_{net} = W_A + W_f$$

$$= F_A d \cos\theta_A + F_{fk} d \cos\theta_f$$

$$= (100N)(2m)\cos(0°) + (49N)(2m)\cos(180°)$$

$$= 102\ J$$

$F_{fk} = \mu_k F_N = 49N$

$\Sigma F_y = 0$

$F_N = F_g$

$= 196\ N$